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**UTILITY  
PATENT APPLICATION  
TRANSMITTAL***(Only for new nonprovisional applications under 37 CFR 1.53(b))*

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YASUHIRO KOMORI, ET AL.

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JCS11 U.S. PTO  
09/661394**APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

**ADDRESS TO:**Assistant Commissioner for Patents  
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Washington, DC 202311. ☒ Fee Transmittal Form  
(Submit an original, and a duplicate for fee processing)2. ☒ Specification Total Pages **41**3. ☒ Drawing(s) (35 USC 113) Total Sheets **2**4. ☒ Oath or Declaration Total Pages **2**a. ☒ Newly executed (original or copy)b. ☐ Unexecuted for information purposesc. ☐ Copy from a prior application (37 CFR 1.63(d))  
(for continuation/divisional with Box 17 completed)  
**[Note Box 5 below]**i. ☐ **DELETION OF INVENTOR(S)**  
Signed Statement attached deleting  
inventor(s) named in the prior application, see  
37 CFR 1.63(d)(2) and 1.33(b).5. ☐ Incorporation By Reference (useable if Box 4c is checked)  
The entire disclosure of the prior application, from which a copy of  
the oath or declaration is supplied under Box 4c, is considered as  
being part of the disclosure of the accompanying application and is  
hereby incorporated by reference therein.6. ☐ Microfiche Computer Program (Appendix)7. Nucleotide and/or Amino Acid Sequence Submission  
(if applicable, all necessary)a. ☐ Computer Readable Copyb. ☐ Paper Copy (identical to computer copy)c. ☐ Statement verifying identity of above copies**ACCOMPANYING APPLICATION PARTS**8. ☒ Assignment Papers (cover sheet & document(s))9. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney  
(when there is an assignee)10. ☐ English Translation Document (if applicable)11. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS  
Citations12. ☐ Preliminary Amendment13. ☒ Return Receipt Postcard (MPEP 503)  
(Should be specifically itemized)14. ☐ Small Entity ☐ Statement filed in prior application  
Statement(s) Status still proper and desired15. ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)16. ☐ Other: \_\_\_\_\_

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No. \_\_\_\_\_**18. CORRESPONDENCE ADDRESS**☒ Customer Number or Bar Code Label**05514**

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CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
	TOTAL CLAIMS (37 CFR 1.16(c))	38-20 =	18	X \$ 18.00 =	\$ 324.00
	INDEPENDENT CLAIMS (37 cfr 1.16(b))	23-3 =	20	X \$ 78.00 =	\$ 1560.00
	MULTIPLE DEPENDENT CLAIMS (if applicable) (37 CFR 1.16(d))			\$ 260 00 =	\$ 0.00
				BASIC FEE (37 CFR 1.16(a))	\$ 690.00
	Total of above Calculations =				\$ 2574.00
	Reduction by 50% for filing by small entity (Note 37 CFR 1.9, 1.27, 1.28).				
	TOTAL =				\$ 2574.00

19. Small entity status

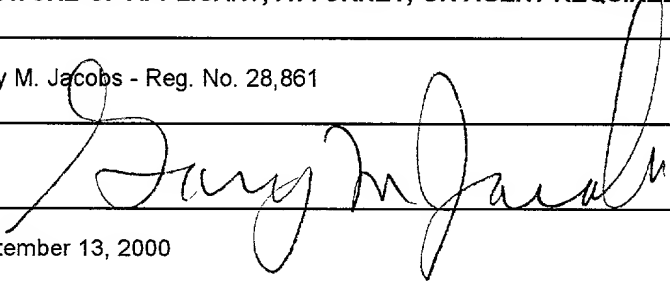
- a. ☐ A Small entity statement is enclosed
- b. ☐ A small entity statement was filed in the prior nonprovisional application and such status is still proper and desired.
- c. ☐ Is no longer claimed.

20. ☒ A check in the amount of \$ 2574.00 to cover the filing fee is enclosed.

21. ☒ A check in the amount of \$ 40.00 to cover the recordal fee is enclosed.

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- a. ☒ Fees required under 37 CFR 1.16.
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED	
NAME	Gary M. Jacobs - Reg. No. 28,861
SIGNATURE	
DATE	September 13, 2000

GMJ/cmv

TITLE OF THE INVENTION  
SPEECH INPUT TERMINAL, SPEECH RECOGNITION APPARATUS,  
SPEECH COMMUNICATION SYSTEM, AND  
SPEECH COMMUNICATION METHOD

5

FIELD OF THE INVENTION

The present invention relates to a speech input terminal, speech recognition apparatus, speech communication system, and speech communication method,  
10 which are used to transmit speech data through a communication network and execute speech recognition.

BACKGROUND OF THE INVENTION

A speech communication system is proposed, in which  
15 speech data is sent from a speech input terminal such as a portable telephone to a host server through a communication network, and processing for retrieval of specific information and the like are executed. In such a speech communication system, since data can be  
20 transmitted/received by speech, operation can be facilitated.

However, speech data fluctuate depending on the characteristics of a speech input terminal such as a portable telephone itself, the surrounding environment,  
25 and the like, and hence satisfactory speech recognition may not be performed.

In addition, since communication is performed under the same communication conditions under any circumstances, high communication efficiency cannot always be ensured.

5

## SUMMARY OF THE INVENTION

The present invention has been made in consideration of the situation associated with a speech input terminal, and has as its object to provide a speech input terminal, speech recognition apparatus, speech communication system, and speech communication method which can implement optimal  
10 speech recognition or communication.

According to the present invention, there is provided a speech input terminal for transmitting speech data to a speech recognition apparatus through a wire or wireless  
15 communication network, comprising speech input means, means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the speech recognition  
20 apparatus.

In the present invention, the information is information unique to the speech input terminal or information about the surrounding environment or operation state associated with the speaker himself/herself. For  
25 example, the information includes the characteristics of the speech input terminal itself, e.g., the characteristics of

a microphone for speech input, information about the surrounding environment in which the speech input terminal is used, or the speech features of the person using the speech input terminal. This information also includes information  
5 obtained by performing acoustic analysis processing for the original data obtained from the input means.

The speech input terminal of the present invention can further comprise means for, when a data conversion condition for communication based on the information is received from  
10 the speech recognition apparatus, converting the speech data on the basis of the conversion condition.

The speech input terminal of the present invention can further comprise means for storing the information, means for determining whether there has been a change in the  
15 information in each communication, and means for, when there has been no change in the information, notifying the speech recognition apparatus of the corresponding information.

In the speech input terminal of the present invention, the terminal further comprises means for creating a speech  
20 recognition model on the basis of the information, and the communication means can transmit the information and/or the speech recognition model to the speech recognition apparatus.

According to the present invention, there is provided  
25 a speech recognition apparatus comprising speech recognition means for executing speech recognition

processing for speech data transmitted from a speech input terminal through a wire or wireless communication network, and means for receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, wherein said speech recognition means executes speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the transmitted speech data, and means for executing speech recognition processing on the basis of the information.

The speech recognition apparatus of the present invention can further comprise means for creating a speech recognition model on the basis of the information.

According to the present invention, there is provided a speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising means for receiving information for speech recognition, which is unique to the

speech input terminal or represents an operation state thereof from the speech input terminal, means for determining a data conversion condition for communication on the basis of the information, and means for transmitting  
5 the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless  
10 communication network comprising means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the transmitted speech data, means for determining a data conversion condition for  
15 communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

In the speech recognition apparatus of the present invention, the data conversion condition can include a data  
20 conversion condition based on a quantization table created on the basis of the information.

The speech recognition apparatus of the present invention can further comprise means for, when the speech input terminal comprises a plurality of speech input  
25 terminals, storing the information in correspondence with each of the speech input terminals.

The speech recognition apparatus of the present invention can further comprise means for, when the speech input terminal comprises a plurality of speech input terminals, storing the speech recognition model in  
5 correspondence with each of the speech input terminals.

The speech recognition apparatus of the present invention can further comprise means for, when the speech input terminal comprises a plurality of speech input terminals, storing the data conversion condition in  
10 correspondence with each of the speech input terminals.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless  
15 communication network wherein the speech input terminal comprises speech input means, means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the  
20 speech recognition apparatus, and the speech recognition apparatus comprises means for executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication system comprising a speech input  
25 terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless

communication network wherein the speech recognition apparatus comprises means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal, and means for executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein the speech input terminal comprises speech input means, means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and communication means for transmitting the information to the speech recognition apparatus, and the speech recognition apparatus comprises means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication system comprising a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network wherein the speech recognition

apparatus comprises means for creating information for  
speech recognition, which is unique to the speech input  
terminal or represents an operation state thereof, on the  
basis of speech data from the speech input terminal, means  
5 for determining a data conversion condition for  
communication on the basis of the information, and means for  
transmitting the data conversion condition to the speech  
input terminal.

According to the present invention, there is provided  
10 a speech communication method of transmitting speech data  
from a speech input terminal to a speech recognition  
apparatus through a wire or wireless communication network  
comprising in the speech input terminal, the step of creating  
information for speech recognition, which is unique to the  
15 speech input terminal or represents an operation state  
thereof, and the step of transmitting the information to the  
speech recognition apparatus.

According to the present invention, there is provided  
a speech communication method of executing speech  
20 recognition processing for speech data transmitted from a  
speech input terminal through a wire or wireless  
communication network comprising the step of receiving  
information for speech recognition, which is unique to the  
speech input terminal or represents an operation state  
25 thereof from the speech input terminal, and the step of  
executing speech recognition processing on the basis of the

information.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of data transmitted from the speech input terminal, and the step of executing speech recognition processing on the basis of the information.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising the step of receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, the step of determining a data conversion condition for communication on the basis of the information, and the step of transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless

communication network comprising the step of creating  
information for speech recognition, which is unique to the  
speech input terminal or represents an operation state  
thereof, on the basis of data transmitted from the speech  
5 input terminal, the step of determining a data conversion  
condition for communication on the basis of the information,  
and the step of transmitting the data conversion condition  
to the speech input terminal.

According to the present invention, there is provided  
10 a speech communication method between a speech input  
terminal and a speech recognition apparatus which can  
communicate with each other through a wire or wireless  
communication network comprising, in the speech input  
terminal, the step of creating information for speech  
15 recognition, which is unique to the speech input terminal  
or represents an operation state thereof, and the step of  
transmitting the information to the speech recognition  
apparatus, and, in the speech recognition apparatus, the  
step of executing speech recognition processing on the basis  
20 of the information.

According to the present invention, there is provided  
a speech communication method between a speech input  
terminal and a speech recognition apparatus which can  
communicate with each other through a wire or wireless  
25 communication network comprising, in the speech recognition  
apparatus, the step of creating information for speech

recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal, and the step of executing speech recognition processing on the basis of the  
5 information.

According to the present invention, there is provided a speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless  
10 communication network comprising, in the speech input terminal, the step of creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, and the step of transmitting the information to the speech recognition  
15 apparatus, and, in the speech recognition apparatus, the step of determining a data conversion condition for communication on the basis of the information; and the step of transmitting the data conversion condition to the speech input terminal.

20 According to the present invention, there is provided a speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising, in the speech recognition  
25 apparatus, the step of creating information for speech recognition, which is unique to the speech input terminal

or represents an operation state thereof, on the basis of  
speech data from the speech input terminal, the step of  
determining a data conversion condition for communication  
on the basis of the information; and the step of transmitting  
5 the data conversion condition to the speech input terminal.

According to the present invention, there is provided  
a storage medium recording a program for, in order to transmit  
speech data from a speech input terminal to a speech  
recognition apparatus through a wire or wireless  
10 communication network, causing a computer to function as  
means for creating information for speech recognition, which  
is unique to the speech input terminal or represents an  
operation state thereof, and communication means for  
transmitting the information to the speech recognition  
15 apparatus.

According to the present invention, there is provided  
a storage medium recording a program for, in order to execute  
speech recognition processing on the basis of speech data  
sent from a speech input terminal through a wire or wireless  
20 communication network, causing a computer to function as  
means for receiving information for speech recognition,  
which is unique to the speech input terminal or represents  
an operation state thereof from the speech input terminal,  
and means for executing speech recognition processing on the  
25 basis of the information.

According to the present invention, there is provided

a storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to function as  
5 means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the speech data transmitted from the speech input terminal, and means for executing speech recognition processing on the basis of the  
10 information.

According to the present invention, there is provided a storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless  
15 communication network, causing a computer to function as means for receiving information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof from the speech input terminal, and means for determining a data conversion condition for  
20 communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

According to the present invention, there is provided a storage medium recording a program for, in order to execute  
25 speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless

communication network, causing a computer to function as means for creating information for speech recognition, which is unique to the speech input terminal or represents an operation state thereof, on the basis of the speech data  
5 transmitted from the speech input terminal, means for determining a data conversion condition for communication on the basis of the information, and means for transmitting the data conversion condition to the speech input terminal.

Other features and advantages of the present  
10 invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures thereof.

15 BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the  
20 invention.

Fig. 1 is a block diagram showing the arrangement of a speech communication system according to an embodiment of the present invention; and

Fig. 2 is a flow chart showing the processing  
25 performed by the speech communication system according to the embodiment.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiments of the present invention will now be described in detail in accordance with the accompanying drawings.

Fig. 1 is a block diagram showing the arrangement of a speech communication system according to an embodiment of the present invention.

The speech communication system is comprised of a portable terminal 100 serving as a speech input terminal, a main body 200 serving as a speech recognition apparatus, and a communication line 300 for connecting these components to allow them to communicate with each other.

The portable terminal 100 includes an input/output unit 101 for inputting/outputting speech, a communication control unit 102 for executing communication processing with the main body 200, an acoustic processing unit 103 for performing acoustic processing for the input speech, an environment information creation unit 104 for creating information unique to the portable terminal 100 or information indicating its operation state (to be referred to as environment information hereinafter in this embodiment), and a speech communication information creation unit 105.

The main body 200 includes an environment adaptation unit 201 for performing processing based on the environment

information of the portable terminal 100, a communication control unit 202 for executing communication processing with the portable terminal 100, a speech recognition unit 203 for executing speech recognition processing for speech data from the portable terminal 100, a speech communication information creation unit 204 for setting data conversion conditions for communication, a speech recognition model holding unit 205, and an application 206.

The sequence of operation of the speech communication system having the above arrangement will be described next with reference to Fig. 2. Fig. 2 is a flow chart showing the processing performed by the speech communication system.

The processing performed by the speech communication system is constituted by an initialization mode of analyzing environment information and a speech recognition mode of communicating speech data.

In step S401, all processes are started. Information for the start of processing is sent from the input/output unit 101 to the communication control unit 202 of the main body 200 through the communication control unit 102.

In step S402, a message is selectively sent from the speech recognition unit 203 or application 206 to the portable terminal 100. When, for example, supervised speaker adaptation based on environment information is to be performed, a list of contents to be read aloud by a user

is sent and output as a message (speech or characters) from the input/output unit 101 of the portable terminal 100. When microphone adaptation based on environment information is to be performed, information for prompting the utterance of speech for a few seconds may be output as a message from the input/output unit 101 of the portable terminal 100. On the other hand, when noise adaptation based on environment information is to be performed, step S402 may be skipped.

10           In step S403, speech data (containing noise) is entered from the input/output unit 101 to create environment information in the portable terminal portable terminal 100.

          In step S404, the acoustic processing unit 103 acoustically analyzes the entered speech data. If the environment information is to be converted into a model (average, variance, or phonemic model), the information is sent to the environment information creation unit 104. Otherwise, the acoustic analysis result is sent from the communication control unit 102 to the main body. Note that the speech data may be directly sent without performing any acoustic analysis to the main body to be subjected to analysis and the like on the main body 200 side.

          When the environment information is converted into a model in step S404, the flow advances to step S405 to cause the environment information creation unit 104 to create

environment information. For the purpose of noise adaptation, for example, environment information is created by detecting a non-speech interval and obtaining the average and variance of parameters in the interval. For  
5 the purpose of microphone adaptation, environment information is created by obtaining the average and variance of parameters in a speech interval. For the purpose of speaker adaptation, a phonemic model or the like is created.

10 In step S406, the created environment information model, acoustic analysis result, or speech is sent from the communication control unit 102 to the main body 200.

In step S407, the main body 200 receives sent the environment information through the communication control  
15 unit 202.

In step S408, the environment adaptation unit 201 performs environment adaptation with respect to a speech recognition model in the speech recognition model holding unit 205 on the basis of the environment information to  
20 update the speech recognition model into an environment adaptation speech recognition model. This model is then held by the speech recognition model holding unit 205.

As a method for environment adaptation, for example, a PMC technique can be used, which creates an environment  
25 adaptation speech recognition model from a noise model and speech recognition model. In the case of microphone

adaptation, for example, a CMS technique can be used, which creates an environment adaptive speech recognition model by using the average of speech for adaptation and a speech recognition model.

5           In the case of speaker adaptation, for example, a method of creating a speaker adaptation model by using a speaker adaptation model and speech recognition model can be used. If a speech or acoustic analysis result is sent instead of an environment information model, a method of  
10   converting environment information into a model and further performing adaptation on the main body 200 side can be used. Alternatively, a method of performing environment adaptation by directly using a speech or acoustic analysis result, EM learning technique, VFS speaker adaptation  
15   technique, or the like can be used as an environment adaptation method. Creating an environment adaptive speech recognition model can improve recognition performance.

          Obviously, a speech recognition model may be created  
20   on the portable terminal 100 side and sent to the main body 200 to be used.

          In step S409, in order to improve the communication efficiency of speech recognition, the speech communication information creation unit 204 performs environment  
25   adaptation for a table for the creation of communication speech information. A method of creating a scalar

quantization table of parameters of the respective dimensions which are used for speech recognition by using the distribution of environment adaptive speech recognition models will be described below. As this method, various methods can be used. The simplest method is a method of searching  $3\sigma$  of the respective dimensions for the maximum and minimum values, and dividing the interval therebetween into equal portions.

The number of quantization points may be decreased by a method of merging all distributions into one distribution, searching  $3\sigma$  (e.g., a range in which most of samples appearing in a Gauss distribution are included) for the maximum and minimum values, and dividing the interval therebetween into equal portions.

As a more precise method, for example, a method of assigning quantization points in accordance with the bias of all distributions may be used. In this method, since a scalar quantization table of the respective dimensions is created by using the distribution of environment adaptive speech recognition models, the bit rate for communication can be decreased without degrading the recognition performance, thus allowing efficient communication.

In step S410, the created scalar quantization table is transmitted to the portable terminal 100.

In step 411, the created scalar quantization table

is received by the portable terminal 100 and stored in the speech communication information creation unit 105.

With the above operation, the initialization mode is terminated. If a plurality of portable terminals 100 are present, the main body 200 can store data such as  
5 environment information, speech recognition models, and quantization tables in units of portable terminals.

The flow then shifts to the speech recognition mode.

In step S412, speech is input through the  
10 input/output unit 101.

In step S413, the input speech data is acoustically analyzed by the acoustic processing unit 103, and the resultant data is sent to the speech communication information creation unit 105.

15 In step S414, the speech communication information creation unit 105 performs scalar quantization of the acoustic analysis result on the speech data by using a scalar quantization table, and encodes the data as speech communication information. The encoded speech data is  
20 transmitted to the main body 200 through the communication control unit 102.

In step S415, the main body 200 causes the speech recognition unit 203 to decode the received speech data, execute speech recognition processing, and output the  
25 recognition result. Obviously, in this speech recognition processing, the previously created speech recognition

model is used.

In step S416, the speech recognition result is interpreted by the application 206 to obtain an application corresponding to the result, and the application result is  
5 sent to the communication control unit 202.

In step S417, the application result is sent to the portable terminal 100 through the communication control unit 202 of the main body 200.

In step S418, the portable terminal 100 receives the  
10 application result through the communication control unit 102.

In step S419, the portable terminal 100 outputs the application result from the input/output unit 101. When speech recognition is to be continued, the flow returns to  
15 step S412.

In step S420, the communication is terminated.

As described above, in the speech communication system of this embodiment, since speech recognition is performed by using a speech recognition model that adapts  
20 to the environment information of the portable terminal 100, optimal speech recognition can be executed in correspondence with each portable terminal. In addition, since communication conditions are set on the basis of environment information, communication efficiency can be  
25 improved in correspondence with each portable terminal.

In this embodiment, in the case of noise, the average

and variance of parameters in a noise interval are obtained and sent to the main body to perform noise adaptation of a speech recognition model by the PMC technique. Obviously, however, another noise adaptation method can be used. In addition, according to the method described above, an average and variance are obtained on the terminal side and transmitted. However, speech information may be sent to the main body side to obtain an average and variance so as to perform noise adaptation.

10 With regards to microphone characteristics, this embodiment has exemplified the method of obtaining the average and variance of parameters in a speech interval of a certain duration, sending them to the main body, and performing microphone characteristic adaptation of a speech recognition model by the CMS technique. Obviously, however, another microphone characteristic adaptation method can be used. In addition, according to the method described above, an average and variance are obtained on the terminal side and transmitted. However, speech information may be sent to the main body side to obtain an average and variance so as to perform noise adaptation.

This embodiment has exemplified the speaker adaptation method of creating a simple phonemic model representing user's speech features in advance, sending it to the main body, and performing speaker adaptation of a speech recognition model. However, speech information may

be sent to the main body side to perform speaker adaptation by using speech on the main body side. Obviously, in this case as well, other various speaker adaptation methods can be used.

5           In this embodiment, noise adaptation, microphone adaptation, and speaker adaptation are described independently. However, they can be properly combined and used.

10           In this embodiment, the initialization mode is to be performed before the speech recognition mode. Once the initialization mode is completed, however, speech recognition can be resumed from the speech recognition mode under the same environment. In this case, the previous environment information is stored on the portable terminal  
15           100 side, and environment information created in resuming speech recognition is compared with the stored information. If no change is detected, the corresponding notification is sent to the main body 200, or the main body 200 performs such determination on the basis of the sent environment  
20           information, thus executing speech recognition.

          In this embodiment, environment information is used for both speech recognition processing and an improvement in speech efficiency. Obviously, however, only one of these operations may be executed by using the environment  
25           information.

          Although the preferred embodiment of the present

invention has been described above, the objects of the present invention are also achieved by supplying a storage medium, which records a program code of a software program that can realize the functions of the above-mentioned

5   embodiments to the system or apparatus, and reading out and executing the program code stored in the storage medium by a computer (or a CPU or MPU) of the system or apparatus. In this case, the program code itself read out from the storage medium realizes the functions of the above-mentioned  
10   embodiments, and the storage medium which stores the program code constitutes the present invention. The functions of the above-mentioned embodiments may be realized not only by executing the readout program code by the computer but also by some or all of actual processing operations executed by  
15   an OS (operating system) running on the computer on the basis of an instruction of the program code.

Furthermore, the functions of the above-mentioned embodiments may be realized by some or all of actual processing operations executed by a CPU or the like arranged  
20   in a function extension board or a function extension unit, which is inserted in or connected to the computer, after the program code read out from the storage medium is written in a memory of the extension board or unit.

As many apparent widely different embodiments of the  
25   present invention can be made without departing from the spirit and scope thereof, it is to be understood that the

invention is not limited to the specific embodiments thereof  
except as defined in the claims.

WHAT IS CLAIMED IS:

1. A speech input terminal for transmitting speech data to a speech recognition apparatus through a wire or wireless communication network comprising:
  - 5 speech input means;  
means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and  
communication means for transmitting the information
- 10 to said speech recognition apparatus.
2. The terminal according to claim 1, wherein the information is based on at least one of a characteristic of said speech input means, a noise characteristic, and a speaker characteristic.
- 15 3. The terminal according to claim 1, further comprising means for, when a data conversion condition for communication based on the information is received from said speech recognition apparatus, converting the speech data on the basis of the conversion condition.
- 20 4. The terminal according to claim 1, further comprising:
  - means for storing the information;
  - means for determining whether there has been a change in the information in each communication; and
  - means for, when there has been no change in the
- 25 information, notifying said speech recognition apparatus of the corresponding information.

5. The terminal according to claim 1, wherein  
said terminal further comprises means for creating a  
speech recognition model on the basis of the information,  
and

5 said communication means transmits the information  
and/or the speech recognition model to said speech  
recognition apparatus.

6. A speech recognition apparatus comprising:  
speech recognition means for executing speech  
10 recognition processing for speech data transmitted from a  
speech input terminal through a wire or wireless  
communication network; and

means for receiving information for speech  
recognition, which is unique to said speech input terminal  
15 or represents an operation state thereof from said speech  
input terminal, wherein said speech recognition means  
executes speech recognition processing on the basis of the  
information.

7. A speech recognition apparatus for executing speech  
20 recognition processing for speech data transmitted from a  
speech input terminal through a wire or wireless  
communication network comprising:

means for creating information for speech recognition,  
which is unique to said speech input terminal or represents  
25 an operation state thereof, on the basis of the transmitted  
speech data; and

means for executing speech recognition processing on the basis of the information.

8. The apparatus according to claim 6, further comprising means for creating a speech recognition model on the basis  
5 of the information.

9. The apparatus according to claim 7, further comprising means for creating a speech recognition model on the basis of the information.

10. A speech recognition apparatus for executing speech  
10 recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

means for receiving information for speech  
recognition, which is unique to said speech input terminal  
15 or represents an operation state thereof from said speech input terminal;

means for determining a data conversion condition for communication on the basis of the information; and

means for transmitting the data conversion condition  
20 to said speech input terminal.

11. A speech recognition apparatus for executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

25 means for creating information for speech recognition, which is unique to said speech input terminal or represents

an operation state thereof, on the basis of the transmitted speech data;

means for determining a data conversion condition for communication on the basis of the information; and

5 means for transmitting the data conversion condition to said speech input terminal.

12. The apparatus according to claim 10, wherein the data conversion condition includes a data conversion condition based on a quantization table created on the basis of the  
10 information.

13. The apparatus according to claim 11, wherein the data conversion condition includes a data conversion condition based on a quantization table created on the basis of the information.

15 14. The apparatus according to claim 6, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with to each of said speech input terminals.

20 15. The apparatus according to claim 7, further comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with to each of said speech input terminals.

25 16. The apparatus according to claim 10, further comprising means for, when said speech input terminal

comprises a plurality of speech input terminals, storing the information in correspondence with each of said speech input terminals.

17. The apparatus according to claim 11, further  
5 comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the information in correspondence with each of said speech input terminals.

18. The apparatus according to claim 8, further comprising  
10 means for, when said speech input terminal comprises a plurality of speech input terminals, storing the speech recognition model in correspondence with each of said speech input terminals.

19. The apparatus according to claim 10, further  
15 comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the data conversion condition in correspondence with each of said speech input terminals.

20. The apparatus according to claim 11, further  
20 comprising means for, when said speech input terminal comprises a plurality of speech input terminals, storing the data conversion condition in correspondence with each of said speech input terminals.

21. A speech communication system comprising a speech  
25 input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless

communication network wherein

said speech input terminal comprises

speech input means,

means for creating information for speech recognition,

5 which is unique to said speech input terminal or represents  
an operation state thereof, and

communication means for transmitting the information  
to said speech recognition apparatus, and

said speech recognition apparatus comprises

10 means for executing speech recognition processing on  
the basis of the information.

22. A speech communication system comprising a speech  
input terminal and a speech recognition apparatus which can  
communicate with each other through a wire or wireless

15 communication network wherein

said speech recognition apparatus comprises

means for creating information for speech recognition,

which is unique to said speech input terminal or represents  
an operation state thereof, on the basis of speech data from

20 said speech input terminal, and

means for executing speech recognition processing on  
the basis of the information.

23. A speech communication system comprising a speech  
input terminal and a speech recognition apparatus which can

25 communicate with each other through a wire or wireless  
communication network wherein

said speech input terminal comprises  
speech input means,  
means for creating information for speech recognition,  
which is unique to said speech input terminal or represents  
5 an operation state thereof, and

communication means for transmitting the information  
to said speech recognition apparatus, and

said speech recognition apparatus comprises  
means for determining a data conversion condition for  
10 communication on the basis of the information, and  
means for transmitting the data conversion condition  
to said speech input terminal.

24. A speech communication system comprising a speech  
input terminal and a speech recognition apparatus which can  
15 communicate with each other through a wire or wireless  
communication network wherein

said speech recognition apparatus comprises  
means for creating information for speech recognition,  
which is unique to said speech input terminal or represents  
20 an operation state thereof, on the basis of speech data from  
said speech input terminal,

means for determining a data conversion condition for  
communication on the basis of the information, and

means for transmitting the data conversion condition  
25 to said speech input terminal.

25. A speech communication method of transmitting speech

data from a speech input terminal to a speech recognition apparatus through a wire or wireless communication network comprising:

in the speech input terminal,

- 5        the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

the step of transmitting the information to the speech recognition apparatus.

- 10    26.    A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of receiving information for speech

- 15    recognition, which is unique to said speech input terminal or represents an operation state thereof from the speech input terminal; and

the step of executing speech recognition processing on the basis of the information.

- 20    27.    A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of creating information for speech

- 25    recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of

data transmitted from the speech input terminal; and

the step of executing speech recognition processing on the basis of the information.

28. A speech communication method of executing speech  
5 recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

the step of receiving information for speech  
10 recognition, which is unique to said speech input terminal or represents an operation state thereof from the speech input terminal;

the step of determining a data conversion condition for communication on the basis of the information; and

the step of transmitting the data conversion condition  
15 to the speech input terminal.

29. A speech communication method of executing speech recognition processing for speech data transmitted from a speech input terminal through a wire or wireless communication network comprising:

20 the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of data transmitted from the speech input terminal;

the step of determining a data conversion condition  
25 for communication on the basis of the information; and

the step of transmitting the data conversion condition

to the speech input terminal.

30. A speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless

5 communication network comprising:

in the speech input terminal,

the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

10 the step of transmitting the information to the speech recognition apparatus, and

in the speech recognition apparatus,

the step of executing speech recognition processing on the basis of the information.

15 31. A speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech recognition apparatus,

20 the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal; and

the step of executing speech recognition processing on the basis of the information.

32. A speech communication method between a speech input

terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech input terminal,

- 5       the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof; and

the step of transmitting the information to the speech recognition apparatus, and

- 10       in the speech recognition apparatus,

the step of determining a data conversion condition for communication on the basis of the information; and

the step of transmitting the data conversion condition to the speech input terminal.

- 15   33. A speech communication method between a speech input terminal and a speech recognition apparatus which can communicate with each other through a wire or wireless communication network comprising:

in the speech recognition apparatus,

- 20       the step of creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, on the basis of speech data from the speech input terminal;

the step of determining a data conversion condition  
25 for communication on the basis of the information; and  
the step of transmitting the data conversion condition

to the speech input terminal.

34. A storage medium recording a program for, in order to transmit speech data from a speech input terminal to a speech recognition apparatus through a wire or wireless

5 communication network, causing a computer to function as means for creating information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof, and

10 communication means for transmitting the information to said speech recognition apparatus.

35. A storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or wireless communication network, causing a computer to

15 function as

means for receiving information for speech recognition, which is unique to said speech input terminal or represents an operation state thereof from said speech input terminal; and

20 means for executing speech recognition processing on the basis of the information.

36. A storage medium recording a program for, in order to execute speech recognition processing on the basis of speech data sent from a speech input terminal through a wire or  
25 wireless communication network, causing a computer to function as

means for creating information for speech recognition,  
which is unique to said speech input terminal or represents  
an operation state thereof, on the basis of the speech data  
transmitted from said speech input terminal, and

5 means for executing speech recognition processing on  
the basis of the information.

37. A storage medium recording a program for, in order to  
execute speech recognition processing on the basis of speech  
data sent from a speech input terminal through a wire or  
10 wireless communication network, causing a computer to  
function as

means for receiving information for speech  
recognition, which is unique to said speech input terminal  
or represents an operation state thereof from said speech  
15 input terminal; and

means for determining a data conversion condition for  
communication on the basis of the information, and

means for transmitting the data conversion condition  
to said speech input terminal.

20 38. A storage medium recording a program for, in order to  
execute speech recognition processing on the basis of speech  
data sent from a speech input terminal through a wire or  
wireless communication network, causing a computer to  
function as

25 means for creating information for speech recognition,  
which is unique to said speech input terminal or represents

an operation state thereof, on the basis of the speech data transmitted from said speech input terminal,

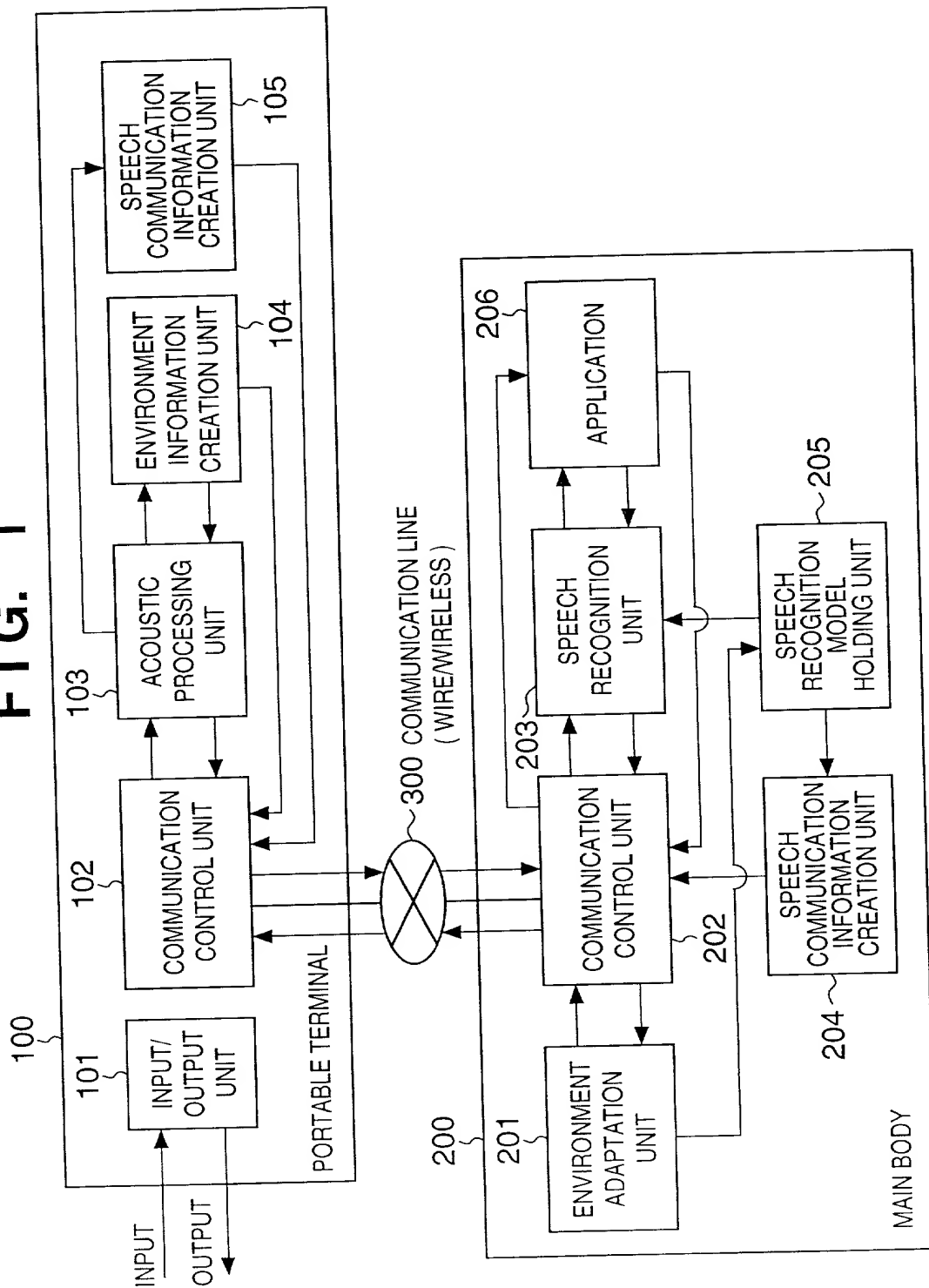
means for determining a data conversion condition for communication on the basis of the information, and

5 means for transmitting the data conversion condition to said speech input terminal.

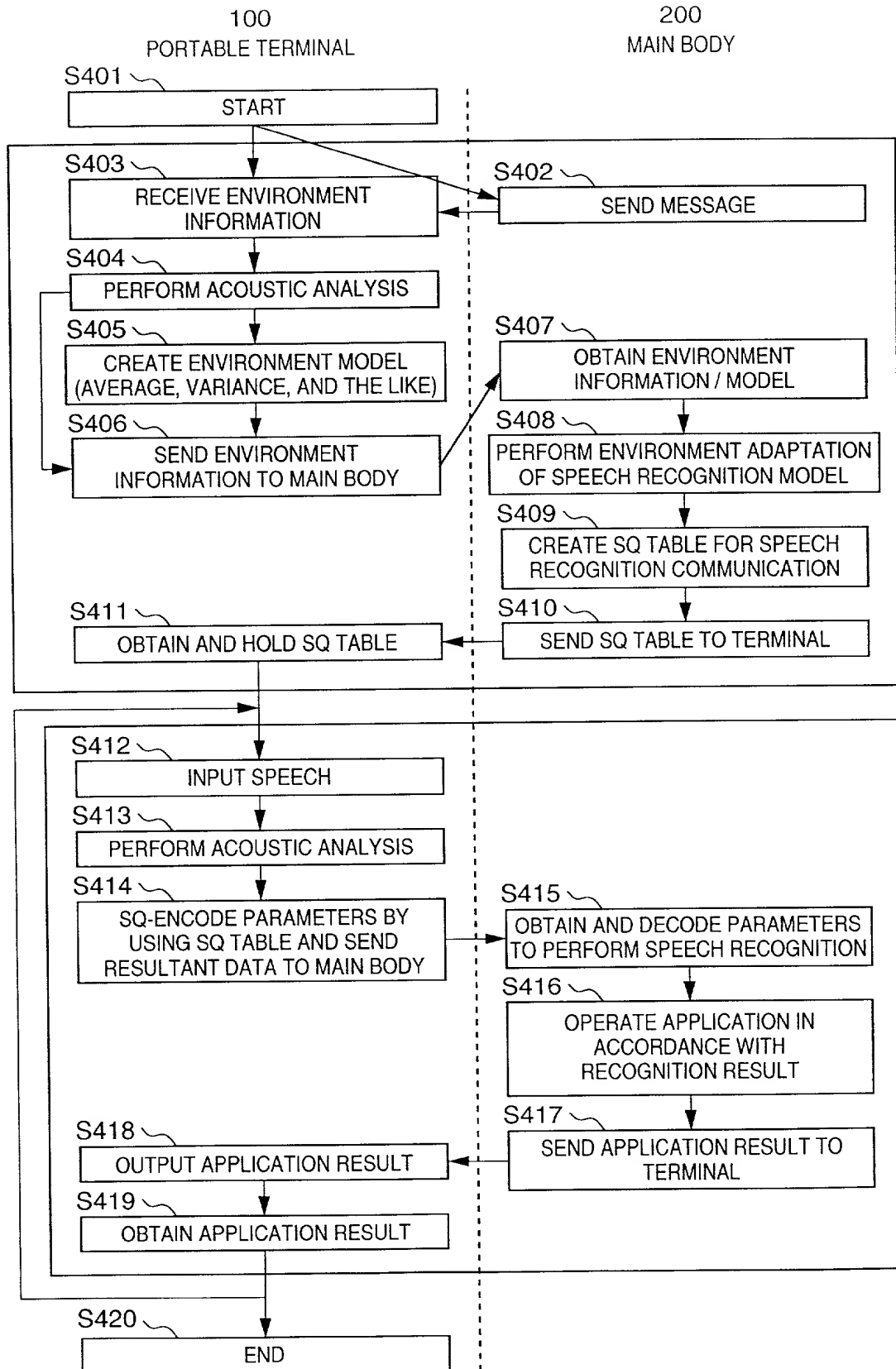
ABSTRACT OF THE DISCLOSURE

A speech communication system comprising a speech  
input terminal and a speech recognition apparatus which can  
communicate with each other through a wire or wireless  
5 communication network wherein the speech input terminal  
comprises speech input unit, a unit for creating environment  
information for speech recognition, which is unique to the  
speech input terminal or represents its operation state, and  
a communication control unit for transmitting the  
10 environment information to the speech recognition apparatus,  
and the speech recognition apparatus executes speech  
recognition processing on the basis of the environment  
information.

FIG. 1



2/2  
**FIG. 2**



**COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION**

(Page 1)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

SPEECH INPUT TERMINAL, SPEECH RECOGNITION APPARATUS,  
SPEECH COMMUNICATION SYSTEM, AND SPEECH COMMUNICATION  
METHOD

the specification of which [ x ] is attached hereto. [ ] was filed on \_\_\_\_\_

as United States Application No. or PCT International Application No. \_\_\_\_\_

and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b), of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designates at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed:

<u>Country</u>	<u>Application No.</u>	<u>Filed (Day/Mo./Yr.)</u>	(Yes/No) <u>Priority Claimed</u>
JAPAN	11-260760	14/09/1999	Yes

I hereby appoint the practitioners associated with the firm and customer number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to the address associated with that Customer Number:

**FITZPATRICK, CELLA, HARPER & SCINTO**  
**Customer Number: 05514**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION

(Page 2)

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